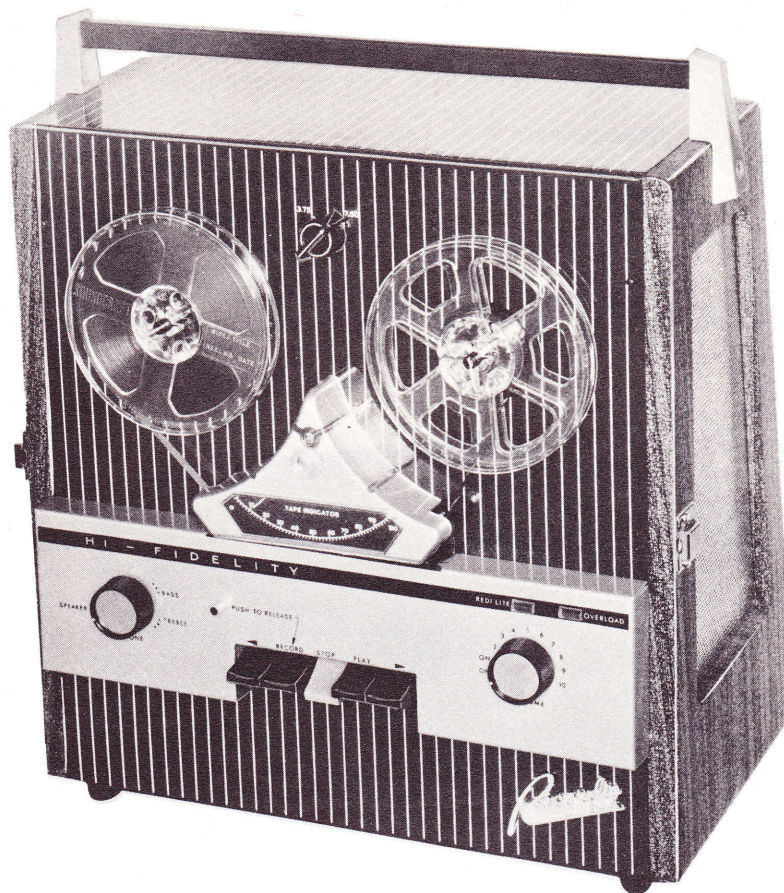
RECORDIO
MODEL 220RECORDIO
MODEL 220

GENERAL INFORMATION

The Recordio Model is a two-speed tape recorder. This unit records and plays back dual-track monaural recordings.

The tape transport mechanism operates at $7\frac{1}{2}$ and $3\frac{3}{4}$ ips. Any size reel up to 7 inches can be used.

This recordio is designed to operate on 110-120 volts, 60-cycle, AC power source. Before connecting to an outlet, make certain that the power source meets the foregoing specifications. Severe damage will result if connected to a higher voltage or to a direct (DC) line.

Manufactured By:

Recordio Corporation
Charlotte, Michigan

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of CQ491



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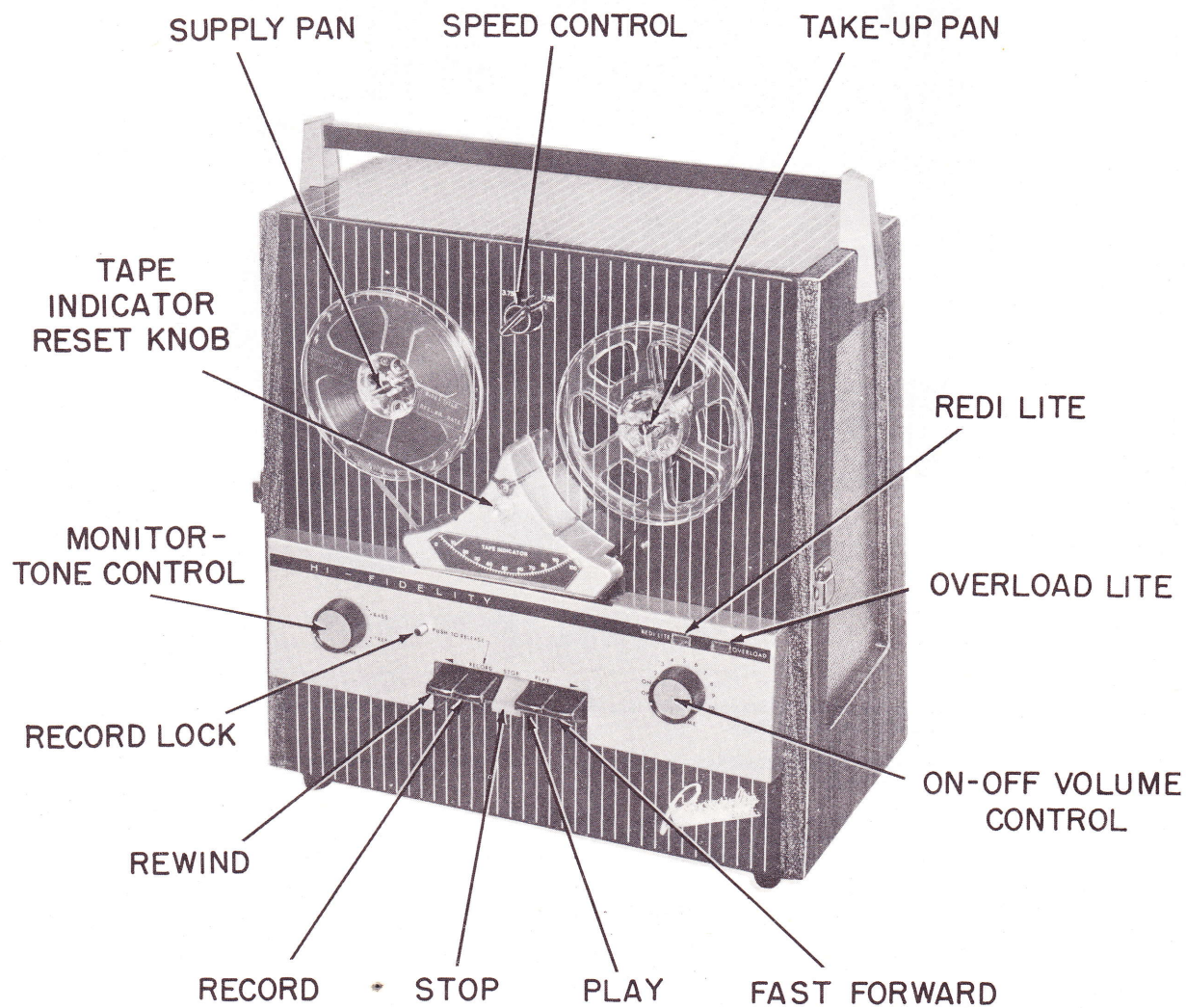


FIG. 1 FRONT VIEW OF UNIT

FUNCTIONS OF CONTROLS & PUSHBUTTONS

Off-On Volume

Clockwise rotation of this control turns the Recordio "on" and regulates the volume for both the recording and playback operations.

Tone-Speaker

Clockwise rotation of this control increases the treble response. Also, when turned clockwise from the SPEAKER position, the speakers are muted when the recorder is in the RECORD mode. Complete counterclockwise rotation of this control provides a means to monitor recordings.

Speed Control

The speed control knob should point to 7.50 or 3.75 according to the speed desired. This Recordio has two tape speeds, 7.50-inches per second and 3.75-inches per second. Insofar as quality of recording-reproduction is concerned, speed is an important factor. The higher the speed, generally, the greater will be the fidelity.

Caution: Do not turn the speed control knob unless the STOP button is depressed.

Tape Indicator

Set the TAPE INDICATOR to zero by turning the knurled reset knob when starting to record or play back a reel of tape. If the reading is noted at various points in the tape travel, new program selections can be in-

dexed, or previously recorded selections can be located with great accuracy.

Rewind Button

This button is used to transfer tape rapidly from the take-up reel (right) to the supply reel (left) at high speed.

Record Button

When depressed, this button starts the Recordio recording any sound fed to the tape from microphone, radio, TV, phonograph, or telephone.

Note: THE "PUSH TO RELEASE" BUTTON MUST BE PRESSED DOWN BEFORE THE RECORD BUTTON CAN BE DEPRESSED.

Stop Button

This button is used to stop tape travel after being in either the PLAY, RECORD, FORWARD, or REWIND modes. It is also a safety feature and must be pressed down when the recorder is not in use.

Play Button

This button starts the Recordio playing back any recording that is on the tape.

Forward Button

This button is used to transfer tape rapidly from the supply reel (left) to the take-up reel (right).

OPERATING INSTRUCTIONS

Preparing For Operation

1. Remove the AC power cord, reel of tape, empty reel, and the microphone from the rear storage compartment.
2. Depress the STOP button.
3. Plug the AC cord into a convenient wall receptacle of the proper rating.
4. Place the speed control knob in the 3.75 or 7.50 position.

Caution: Do not turn speed control knob unless STOP button is depressed.

When the forward (►) or reverse (◄) buttons are depressed, the RECORD and PLAY buttons are locked so they cannot be pressed down, with the possibility of spilling tape. The buttons should always be pressed down firmly until they latch. The STOP button must be depressed before changing functions or speeds of the recorder.

Important: Always depress the STOP button when the Recordio is not in use.

Threading The Tape

1. Place a reel of tape on the supply pan (left) making sure the reel slots catch the protrusions of the pan.
2. Place an empty reel, the same size or larger, on the take-up pan (right). Again make certain the reel slots catch the protrusions of the pan.
3. Release the STOP button by pressing lightly on any one of the other buttons so that all buttons are in the released position. This releases the tape brakes, simplifying tape threading.
4. Unwind about 14-inches of tape from the supply reel. Hold a section straight with both hands and insert the tape in the tape slot making sure the dull coated side faces upward.
5. Insert the free end of the tape into a slot in the hub of the empty reel. While holding the tape in place, give the reel two or three turns to secure the tape to the reel.

To Record From Microphone

1. Insert the microphone plug into the jack on the rear panel labeled MIC.

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2. With the STOP button depressed, turn the ON-OFF VOLUME control to the right (clockwise) until a "click" is heard. Allow the recorder to warm up until the REDI LITE is illuminated.

3. Place the speed control knob in the position desired. As a general rule, 3.75-inches per second for voice, and 7.50-inches per second for music.

4. Depress the PUSH TO RELEASE button with the left hand and with the right hand depress the RECORD button - then release the PUSH TO RELEASE button.

5. While holding the microphone about 3-4-inches away from the mouth, speak in a normal tone of voice and adjust the VOLUME control to the point where the OVERLOAD indicator flashes at the louder or "peak" passages.

Note: To monitor the sound being recorded, turn the TONE-SPEAKER control to its extreme counterclockwise position. Care must be taken to keep the microphone far enough from the recorder to prevent squeal due to acoustic feedback.

Rewind (◀) Or Fast Forward (▶)

When it is desirable to play a certain portion of a tape over again, it is not necessary to rewind the entire reel. By depressing the rewind (◀) button the tape will reverse at a rapid speed. By depressing the fast forward (▶) button the tape will advance at a rapid speed.

To Record From Radio Or TV

While it is possible to record sound from an external source simply by placing the microphone in front of the speaker, this is not recommended as background noises will be recorded along with the desired program materials.

For noise free recordings, record directly from the speaker voice coil terminals of the radio or TV receiver. For this purpose, a patch cord is available from your Recordio dealer.

1. Insert the plug of the patch cord into the jack on the rear panel labeled INPUT.

2. Connect the patch cord alligator clips to the radio or TV receivers speaker voice coil terminals.

3. Adjust the volume control of the radio or TV to normal room volume. Set the tone control of the radio or TV to full treble.

4. Proceed with recording as described under "To Record From Microphone".

To Record From Phonograph

1. Insert the phonograph output plug into the jack on the rear panel labeled INPUT.

2. Start turntable and proceed with recording as described under "To Record From Microphone".

Note: The microphone should not be connected to the Recordio when recording from another source. Also, when the recording is played back, the phono output cable should be removed from the INPUT jack.

To Use Second Track

1. Depress the STOP button when the tape has been wound onto the take-up reel.

2. Remove take-up reel, turn over, and place on supply pan.

3. Place empty reel on take-up pan.

4. Thread tape and proceed with recording as previously described.

To Play Recordings

1. Thread tape as described under "Threading The Tape".

2. Set the speed control knob to the speed at which the recording was made.

3. Depress the PLAY button and adjust the VOLUME and TONE controls for desired listening level.

DISASSEMBLY INSTRUCTIONS

To Remove Unit From Case (Refer to Exploded View)

1. Remove push-on type volume and tone (14) control knobs.

2. Remove two screws (16) located under volume and tone control knobs. Remove front escutcheon (15).

3. Remove two hex-head screws (65) located under front escutcheon.

4. Remove push-on type speed control knob (3).

5. Remove screw (6) from knurled tape indicator knob (7). Remove knob.

6. Remove screw (5) from rear escutcheon (9). Remove rear escutcheon.

7. Remove tape indicator shaft and pointer assembly (10).

8. Remove five Phillip's-head wood screws (21) from front panel. Remove front panel.

9. Remove two flat-head slotted screws from top of cabinet.

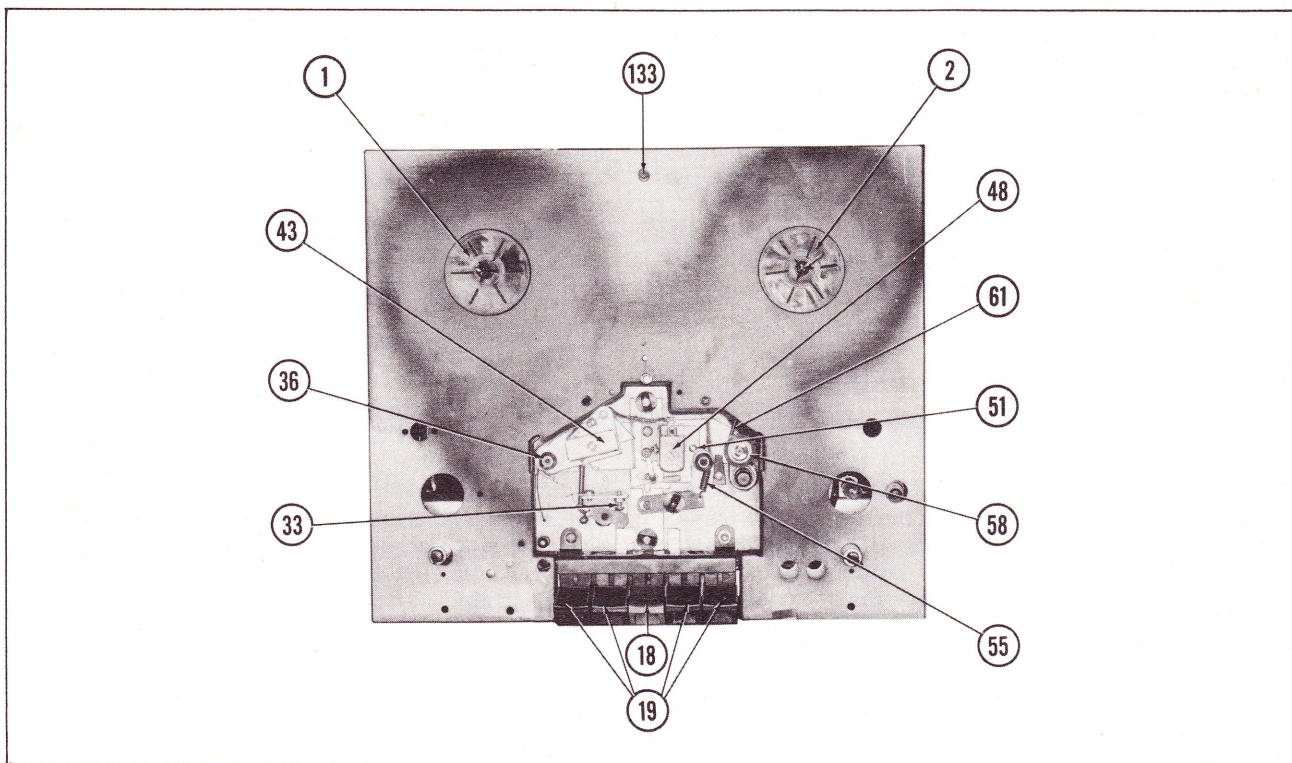


Fig. 2. Front view of transport mechanism - front plate and escutcheons removed.

10. Remove two Phillip's-head screws from each sub-panel on rear of cabinet.

11. Lift tape transport and amplifier assembly partially out front of cabinet. Unplug two speaker leads and remove AC cord clamp before removing unit completely.

To Remove Amplifier From Transport Mechanism

1. Remove seven hex-head sheet metal screws from the amplifier bottom cover. Remove cover.

2. Unsolder motor leads from amplifier.

3. Disconnect the two leads from the play-record head terminals. Pull head leads through hole in baseplate.

4. Remove two Phillip's-head machine screws from each end of amplifier chassis.

5. Carefully lift the amplifier away from the transport mechanism and disconnect the play-record switch actuating link.

MECHANICAL ADJUSTMENTS

Pressure Pad Adjustment (Refer to Exploded View)

1. Remove front escutcheon (15).

2. Depress the PLAY button. Do not turn the Recordio "on".

3. Use a pencil-type postal scale and check the amount of pressure necessary to just pull the right-hand pad away from the play-record head (48). The test should be made at the right-hand end of the pressure pad mounting spring. If necessary, adjust locked adjustment screw (33) until a reading of 1 3/4-oz. $\pm$ 1/4-oz. is obtained.

4. The guide post pressure pad (left-hand pad) is adjusted by bending the pressure pad spring (26). Adjust for minimum pressure against tape.

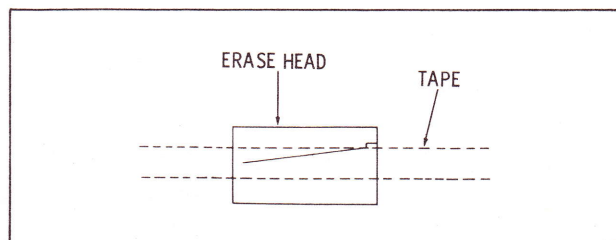


Fig. 3. Erase head tape path.

Erase Head Adjustment

1. With tape properly threaded, turn recorder "on" and depress the RECORD button. Allow tape to run for a few seconds, then turn recorder "off". Leave RECORD button depressed.

2. With front escutcheon (15) and rear escutcheon (9) removed, check erase head (43) to see if it is parallel with the tape.

3. Check to see if the top edge of the tape coincides with the top end of the diagonal slot in the erase head (junction of long diagonal slot and short vertical slot). See Figure 3. To adjust the level of the tape, loosen set screw (35) and rotate tape guide post (36) to move tape up or down. See Exploded View.

Brake Shoe Adjustment (Refer to Exploded View)

1. With all pushbuttons in the "up" position, the brake pads (68) should clear brake drums (102 and 104) by approximately 1/8".

2. Depress the STOP button while observing the brake pads. Both brake pads must contact the brake drums at the same time and with equal pressure.

3. If necessary, adjust by bending brake spring (85).

CLEANING

The majority of defects, other than wear or breakage, can be traced to dirty surfaces. The play-record head (48), capstan, and pressure roller (58) are subject to an accumulation of tape coating oxide, which is worn off the tape as it passes these parts. This

accumulation should be periodically removed since it will cause faint recording and poor playback. Wipe these surfaces carefully with a clean cloth. If dirt is caked and will not come off with a dry cloth, dampen cloth with alcohol or lighter fluid.

LUBRICATION

All rotating parts are provided with generous size oilite bearings which are factory lubricated. Under normal use no further lubrication is necessary. In heavy duty service, the following parts should be lubricated once a year with a drop of # 10 motor oil.

1. The top and bottom motor bearings.
2. The capstan bearing.
3. Pressure roller (58) bearing.
4. All idler and drive wheel bearings.

5. The reel pan bearings.

The basic rule is - do not over lubricate. Oil must be kept off all rubber idlers, belts, and the periphery of flywheel and off parts that might transfer oil to them. Always wipe excess lubricant from parts that have been lubricated.

An occasional cleaning of foreign matter from under the pushbuttons is desirable, and a drop of oil on the sliding lever members is advisable.

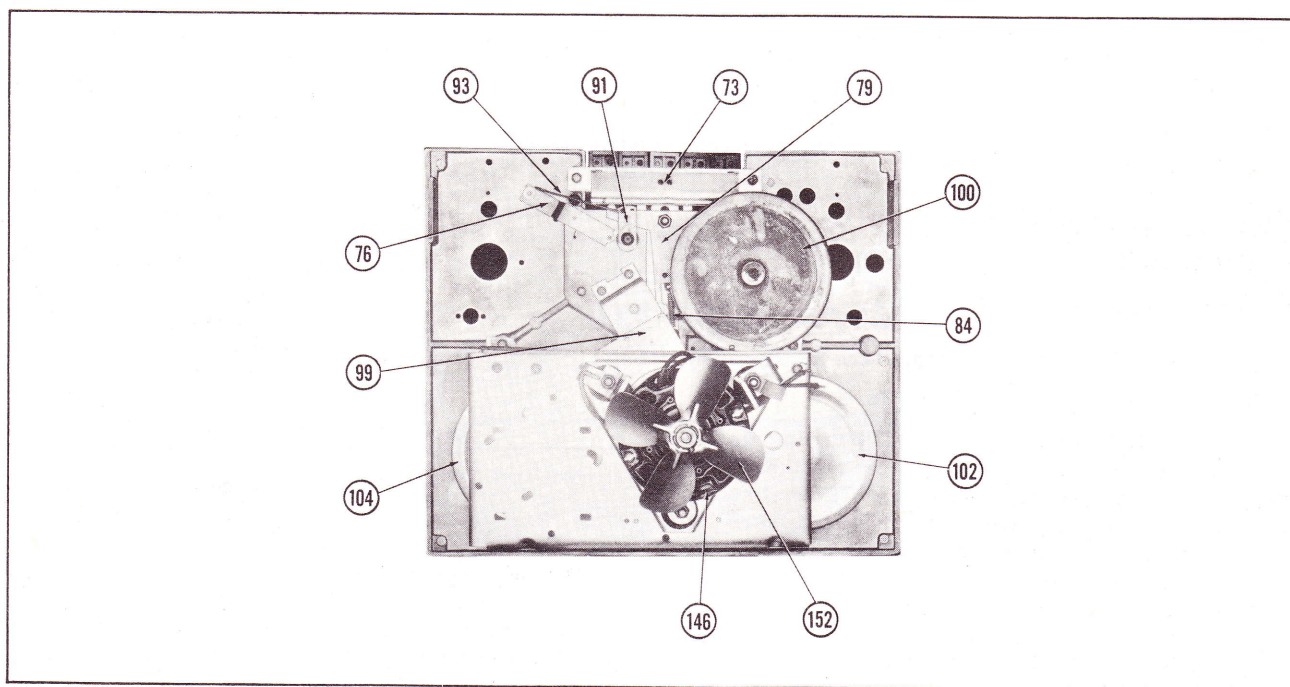


Fig. 4 Bottom view of tape transport mechanism.

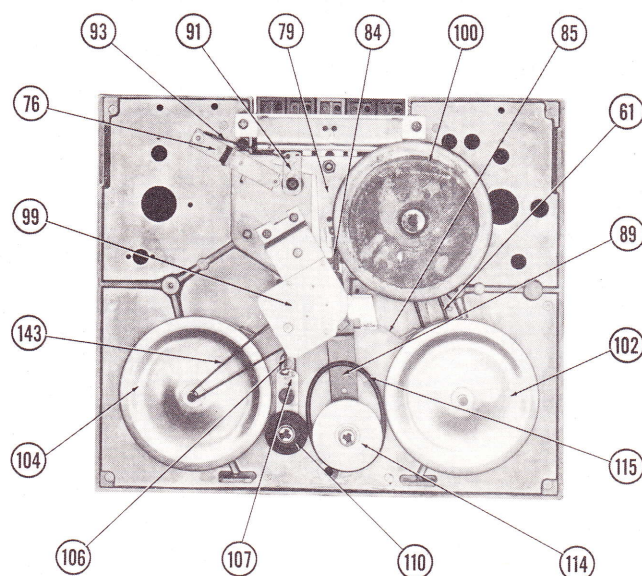


Fig. 5. Bottom view of transport mechanism - motor mounting plate removed.

ELECTRICAL ADJUSTMENTS

Play-Record Head Alignment

1. Remove timer escutcheon (9) and front escutcheon (15).
2. Clean pole piece of play-record head (48) with alcohol or lighter fluid.
3. Thread alignment tape on recorder. Turn VOLUME control to maximum and TONE control to full treble.
4. Connect a VTVM to EXT. SPKR. jack. Set the meter to AC, 3-volt scale.
5. Place recorder in PLAY position, 7 1/2-inch per second tape speed. Decrease VOLUME to point where output is 1-volt on meter. Turn play-record head adjustment screw (51) until maximum point of deflection on meter is obtained.

Bias Adjustment

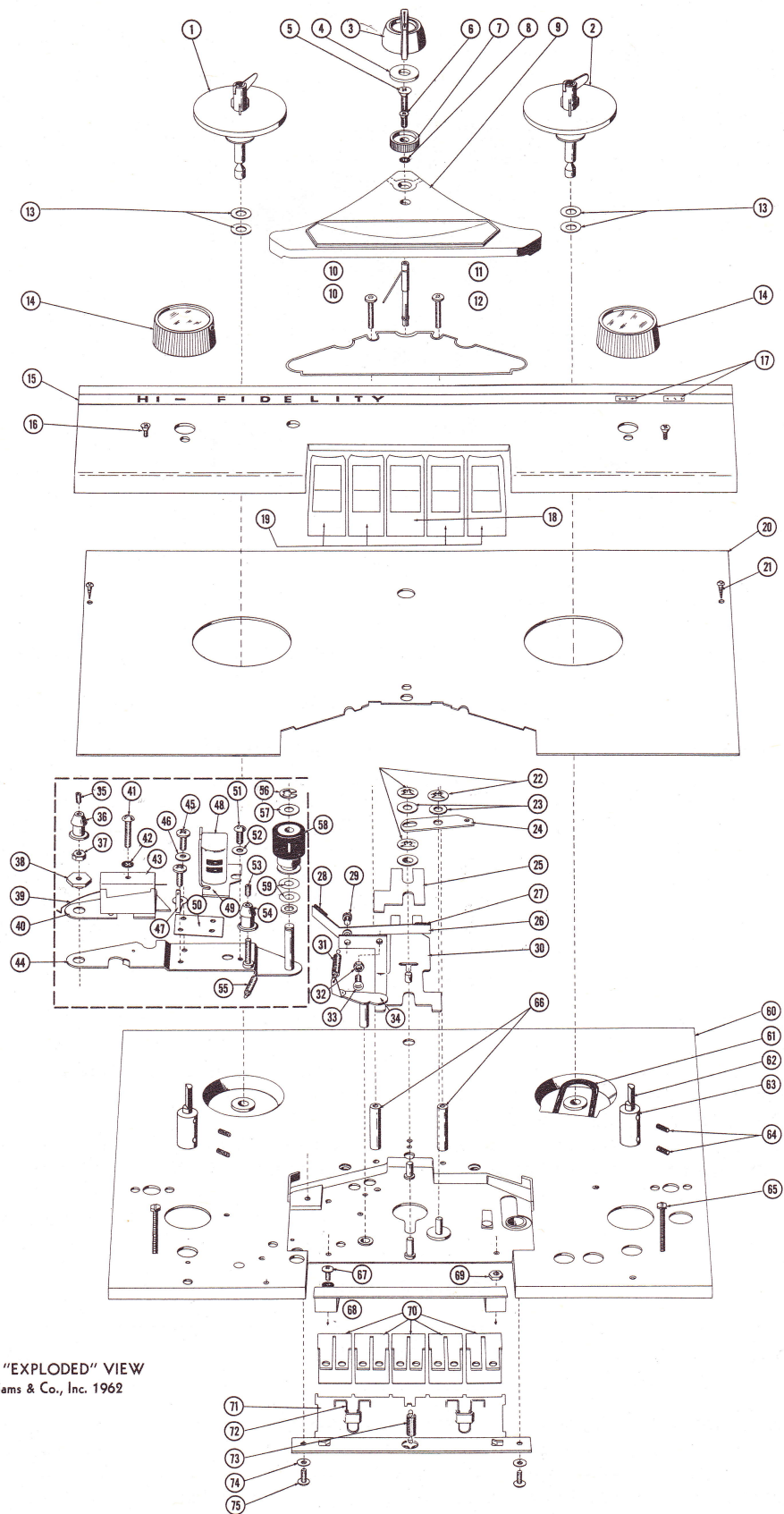
Turn the recorder "on" and depress the RECORD button; use no tape. To determine if the bias is within satisfactory limits without dismantling the unit, connect a VTVM from the blue lead of the play-record head to ground. If approximately 65-volts are present, no adjustment is necessary.

If an adjustment is necessary, proceed as follows:

1. Set line voltage at 117-volts.
2. Place unit in RECORD position and turn VOLUME control to maximum.
3. Connect VTVM between ground and pin 1 of (V3). Place meter selector on AC volts, 10V range.
4. Adjust trimmer (C17) for a reading of 2-volts on the meter.

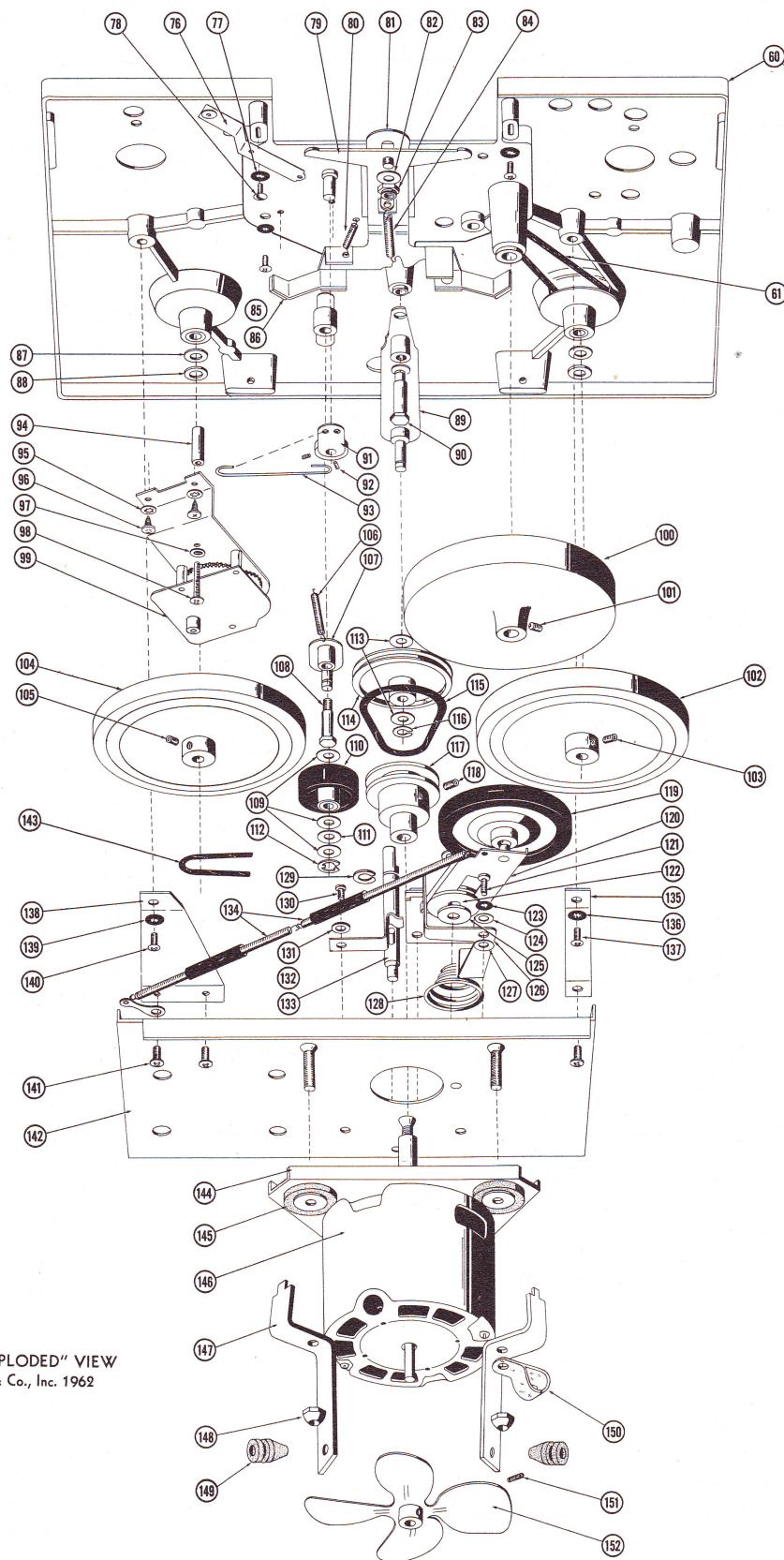
TROUBLE CHART

Symptom	Cause	Remedy
Push buttons fail to latch into position.	1. Lock plate spring (73) disconnected or broken.	1. Connect or replace spring (73).
No drive in Play or Record.	1. Idler tension springs (134) disconnected or broken. 2. Idler slide plate (120) binding on bushing (122), thus preventing idler wheel (119) from moving forward.	1. Connect or replace springs (134). 2. Check slide plate (120) and bushing (122) for burrs. Clean with alcohol.



A PHOTOFAC "EXPLODED" VIEW
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Fig. 6 A Exploded view of parts above baseplate.



A PHOTOFAC "EXPLODED" VIEW
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Fig. 6 B Exploded view of parts below baseplate.

TROUBLE CHART (CONT.)

Symptom	Cause	Remedy
Tape fails to wind on take-up reel during Play or Record.	1. Reel drive belt (61) loose, disconnected, or broken.	1. Connect or replace belt (61).
	2. Reel pan shaft (2) binding.	2. Clean foreign matter from bearing surface and shaft with a clean cloth. Lubricate with one drop of # 10 motor oil.
No Fast Forward or Rewind.	1. Idler lever tension spring (84) disconnected or broken, thereby not actuating idler lever (89).	1. Connect or replace spring (84).
	2. Idler drive belt (115) broken or not properly connected.	2. Replace idler drive belt (115).
Tape spills when Stop button is depressed during Fast Forward or Rewind.	1. Brake shoes out of adjustment.	1. See "Brake Shoe Adjustment" under Mechanical Adjustments.
	2. Brake pads worn out or missing.	2. Replace brake pads.
"Wow" during operation of recorder.	1. Brake return spring (80) disconnected or broken.	1. Connect or replace spring (80).
	2. Check all driving surfaces for oil or foreign matter.	2. Clean with a cloth and alcohol.
"Flutter" during operation of recorder.	1. Dirty play-record head (48), pressure pads, capstan shaft, or pinch roller (58).	1. Clean as described under "Cleaning".
No erase or erase is incomplete.	1. Erase head tension spring (31) disconnected or broken.	1. Connect or replace spring (31).
	2. Erase head (43) not adjusted properly.	2. See "Erase Head Adjustment" under Mechanical Adjustments.
Does not record	1. Faulty microphone or cord.	1. Replace if necessary, after checking recorder with another type of input.
	2. Faulty input jack.	2. Check and replace if necessary.
	3. Faulty tube.	3. Check tubes.
	4. Open play-record head (48).	4. Check continuity. After checking for continuity, demagnetize head.
Motor and amplifier inoperative.	1. Power supply defect.	1. Check voltages per schematic.
	2. Damaged power cord.	2. Repair or replace.
	3. Defective On-Off switch.	3. Replace switch.

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	C-13.318-6	Reel Pan & Shaft Ass'y.	58	B-33.404	Pinch Roller
2	C-13.318-6	Reel Pan & Shaft Ass'y.	59	B-16.104	Shim Washer, Brass
3		Speed Shift Knob	60		Baseplate & Bearing Ass'y.
4	73-2254-3	Felt Washer	61	B-28.175	"O" Ring
5	57-4C-624-5	# 6-32 x 1 1/2" O.H.M.S.	62		
6	57-4C-405-5	# 4-40 x 5/16" O.H.M.S.	63		
7	B-32.302-2	Timer Knob	64	57-3439-0	# 6-32 x 3/16" Bristol Hd.
8	73-2334-3	# 6 Cantlink Washer			Set Screw
9	D-13.363-1	Timer Escutcheon	65	57-60B-616-1	# 6 x 1" H.H.S.M.S.
10	B-26.679-2	Timer Indicator	66	B-33.446	Spacer
10A	B-32.371	Timer Shaft	67	57-1C-603-2	# 6-32 x 3/16" B.H.M.S.
11	57-1C-618-1	# 6-32 x 1 1/8" B.H.M.S.	68	73-2231-4	# 6 Int. Lockwasher
12		Rear Escutcheon Plate	69	48-2219-1	# 6-32 x 5/16" Keps Hex.
13	B-28.163	Linen Washer			Nut
14	B-13.466-1	Knob	70	B-19.876	Pushbutton Lever
15	D-19.1717	Front Escutcheon	71	B-19.859	Pushbutton Hinge Bracket
16	57-1C-618-6	# 6-32 x 1 1/8" B.H.M.S.	72	B-31.337	Pushbutton Return Spring
17	B-13.465	Indicator Window	73	B-31.343	Lock Plate Spring
18	B-13.458-1	Pushbutton (Alum.)	74	73-2231-5	# 8 Int. Lockwasher
19	B-13.458-2	Pushbutton (Black)	75	57-6C-806-1	# 8-32 x 3/8" R.H.M.S.
20		Cabinet Cover Front Plate	76		Record Interlock Spring
21	57-44C-206-1	# 2 x 3/8" O.H.W.S.			Ass'y.
22	B-33.412	Push-On Stud Nut, 3/16"	77	73-2231-5	# 8 Int. Lockwasher
23	73-2241-148F	Flat Washer	78	57-6C-805-1	# 8-32 x 5/16" R.H.M.S.
24		Playback Actuating Lever	79	B-35.1046	Shift Plate Ass'y.
25	B-19.868	Record Slide Plate	80	B-31.338	Brake Return Spring
26	B-19.892	Pressure Pad Spring	81	B-35.835	Brake Slide Plate Ass'y.
27	B-31.334	Felt Pad, Play-Record	82	73-2241-148F	Flat Washer
		Head	83	48-2221	# 10-32 Elastic Stop Nut
28	B-31.334	Felt Pad	84	B-31.339	Idler Lever Tension Spring
29	57-1C-603-1	# 6-32 x 3/16" B.H.M.S.	85	B-35.1070-1	Brake Spring Ass'y.
30	C-19.839-1	Playback Slide Plate	86	B-31.335	Brake Pad, Felt
31	B-31.361	Erase Head Tension Spring	87	73-2340-1	Varnish Impregnated Washer
32	48-410-1	# 6-32 Hex. Nut	88	73-2248-39	Phenolic Washer
33	57-16C-606-1	# 6-32 x 3/8" R.H.M.S.	89	B-35.1051	Idler Lever Ass'y.
34	B-35.882-1	Record Actuating Lever	90	B-32.275-1	# 8-32 Hex. Hd. Shouldered
		Ass'y.			Screw
35	57-3439-0	# 6-32 x 3/16" Bristol Hd.	91	B-35.1452	Switch Lever Ass'y.
		Set Screw	92	57-3698-0	# 8-32 x 3/16" Bristol Hd.
36	B-32.300	Tape Guide Post (Left)			Set Screw
37	48-410-1	# 6-32 Hex. Nut	93	B-31.333	Switch Arm Link
38	B-32.260	Tape Guide Post Spacer	94	B-33.118	Spacer for Gear Train
39	B-31.446-2	Erase Head Return Spring	95	73-2231-4	# 6 Int. Lockwasher
40	B-19.1410-1	Erase Head Mtg. Plate	96	57-1C-603-2	# 6-32 x 7/8" B.H.M.S.
41	57-16B-613-0	# 6-32 x 13/16" R.H.M.S.	97	73-2231-4	# 6 Int. Lockwasher
42	73-2233-5	# 6 Int. Lockwasher	98	57-1C-614-1	# 6-32 x 7/8" B.H.
43	C-35.756	Erase Head Ass'y.	99	D-33.445	Gear Train for Tape
44	B-35.1278	Pinch Roller Plate Ass'y.			Indicator
45	57-1C-603-1	# 6-32 x 3/16" B.H.M.S.	100	C-13.257-1	Flywheel
46	73-2231-4	# 6 Int. Lockwasher	101	57-3589-1	# 8-32 x 1/4" Bristol Hd.
47		Tape Guide Lug			Set Screw
48	B-36.251	Play-Record Head	102	C-35.1050-1	Brake Drum & Bushing
49	B-19.989	Play-Record Head Mtg.			Ass'y.
		Bracket	103	57-3589-1	# 8-32 x 1/4" Bristol Hd.
50	B-19.990	Spring, Play-Record Head			Set Screw
51	57-16C-404-1	# 4-40 x 1/4" R.H.M.S.	104	C-35.1050-1	Brake Drum & Bushing
52	73-2241-134	Flat Washer			Ass'y.
53	57-3439-0	# 6-32 x 3/16" Bristol Hd.	105	57-3589-1	# 8-32 x 1/4" Bristol Hd.
		Set Screw			Set Screw
54	B-32.309	Tape Guide Post (Right)	106		Sub Idler Plate Spring
55	B-31.360	Pinch Roller Tension Spring	107	B-35.1044	Sub Idler Plate Ass'y.
56	B-33.418-2	"E" Ring, 3/16" Shaft	108	B-32.275-1	# 8-32 Hex. Hd. Shouldered
57	B-28.163	Linen Washer	109	B-28.163	Screw
					Linen Washer

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MECHANICAL PARTS LIST (CONT.)

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
110	B-33.405	Sub Idler	131	73-2231-4	# 6 Int. Lockwasher
111	73-2254-6	Felt Washer	132	B-19.961	Spring Clip
112	B-33.418-2	"E" Ring, 3/16" Shaft	133	C-35.816-1	Speed Control Shaft Ass'y.
113	B-28.163	Linen Washer	134	B-31.324	Idler Tension Spring
114	B-35.1066	Sheave Pulley Ass'y.	135	B-19.862	Angle Brkt. for Mtg. Drive Ass'y.
115	B-28.181	Idler Drive Belt	136	73-2231-5	# 8 Int. Lockwasher
116	B-33.418-2	"E" Ring, 3/16" Shaft	137	57-6C-805-1	# 8-32 x 5/16" R.H.M.S.
117	B-32.288	Motor Pulley	138	B-19.863	Drive Mtg. Plate Bracket
118	57-3589-1	# 8-32 x 1/4" Bristol Hd. Set Screw	139	73-2231-5	# 8 Int. Lockwasher
119	B-33.408	Rubber Bonded Idler, 2 1/2" Dia.	140	57-6C-805-1	# 8-32 x 5/16" R.H.M.S.
120	B-35.1064-1	Idler Slide Plate Ass'y.	141	57-6C-805-1	# 8-32 x 5/16" R.H.M.S.
121	57-6C-806-1	# 8-32 x 3/16" R.H.M.S.	142	B-35.1054-2	Drive Mtg. Plate Ass'y.
122		Idler Slide Bushing	143	B-28.181	Idler Drive Belt
123	73-2231-5	# 8 Int. Lockwasher	144		Motor Mtg. Plate
124	73-2241-143	Flat Washer	145	B-28.194-2	Shock Mount
125		Flat Washer	146	D-36-153	Motor
126	B-19.1431-1	Idler Throw-Out Lever	147		Anti-Shock Bracket
127	B-32.291-1	Shouldered Washer	148	48-2221	# 10-32 Elastic Stop Nut
128	B-31.327	Idler Lift Compression Spring	149		Anti-Shock Grommet
129	B-33.407-1	"C" Washer	150	B-33.534	Nylon Cable Clamp
130	57-1C-603-1	# 6-32 x 3/16" B.H.M.S.	151	57-3698-0	# 8-32 x 3/16" Bristol Hd. Set Screw
			152	B-33.643	4" Fan Blade

FIG. 7
TOP VIEW OF
MOTOR MOUNT
PLATE ASS'Y.

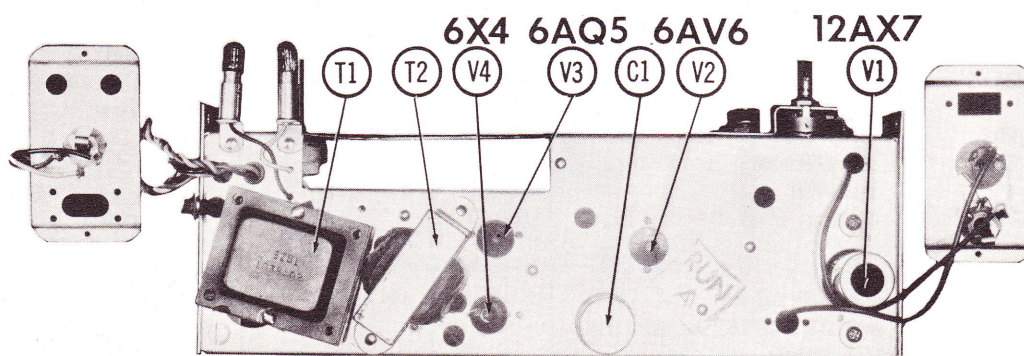
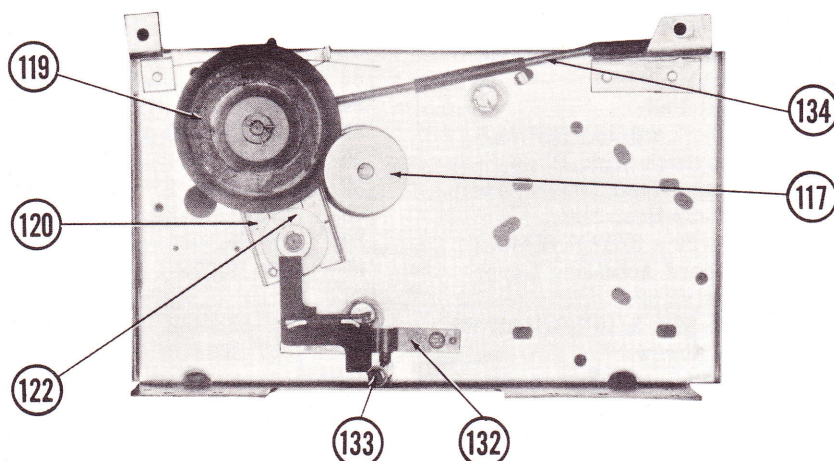


FIG. 8 AMP CHASSIS - TOP VIEW

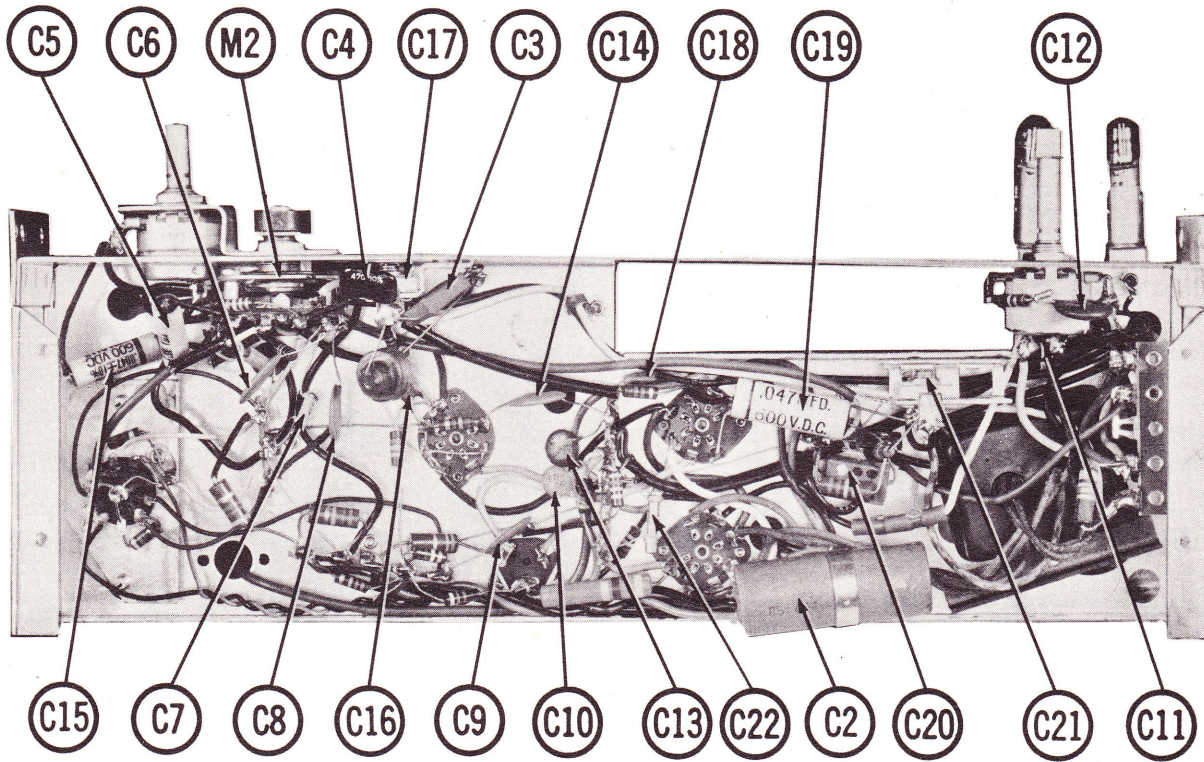


FIG. 9 AMP CHASSIS BOTTOM VIEW - CAPACITOR & MISC IDENT.

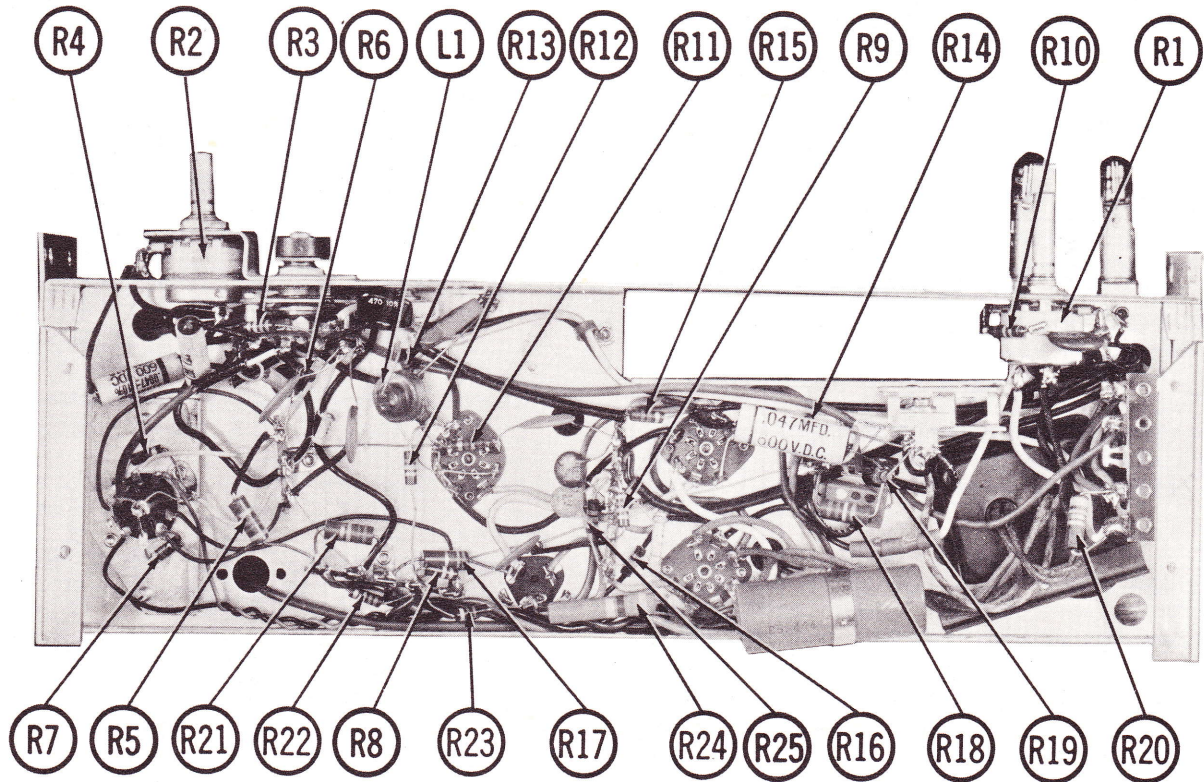
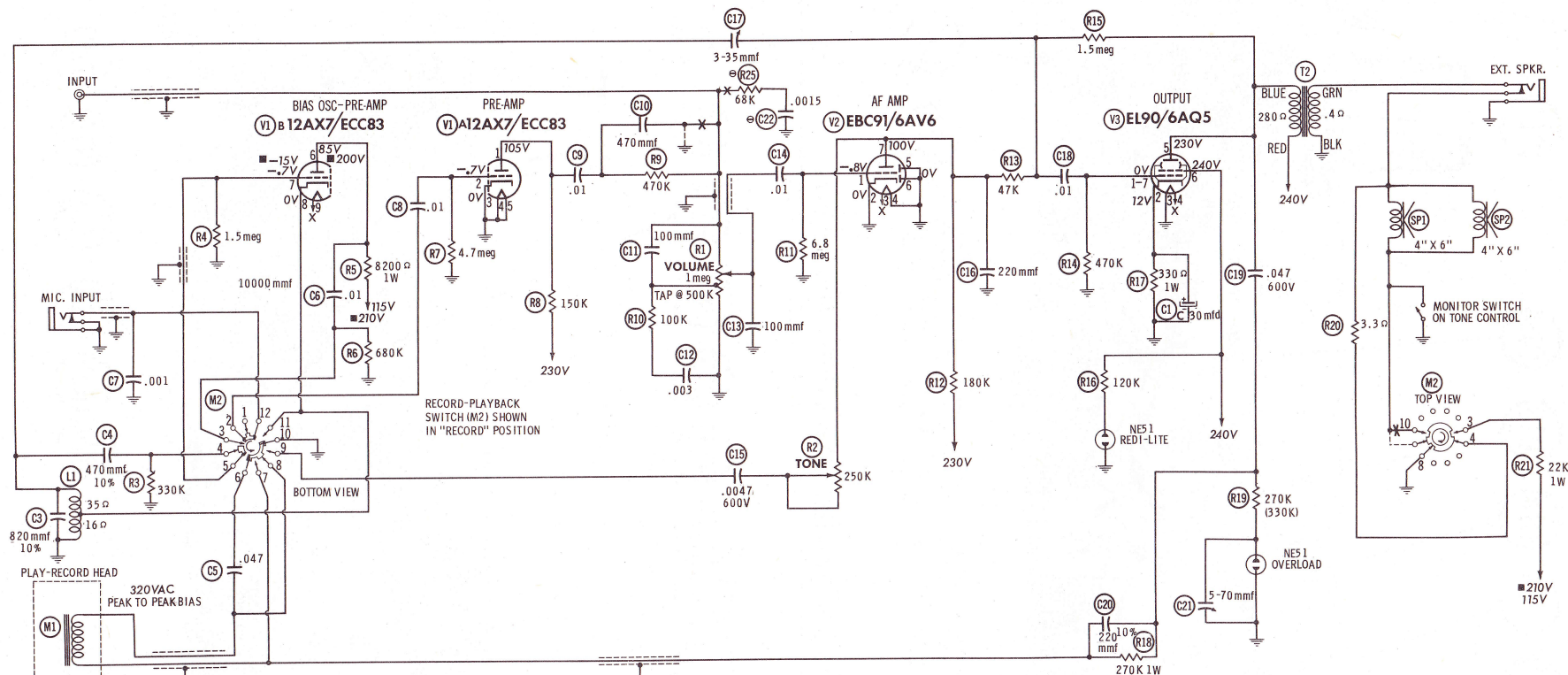


FIG. 10 AMP CHASSIS BOTTOM VIEW - RESISTOR & INDUCTOR IDENT.



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7 ECC83	†155K	4.7meg	0Ω	FIL	FIL	†35K	†330K	16Ω	FIL
V2	EBC91 6AV6	6.8meg	0Ω	FIL	FIL	0Ω	0Ω	†185K		
V3	EL90 6AQ5	470K	330Ω	FIL	FIL	†750Ω	†470Ω	470K		
V4	EZ90 6X4	250Ω	TP	FIL	FIL	FIL	250Ω	†		

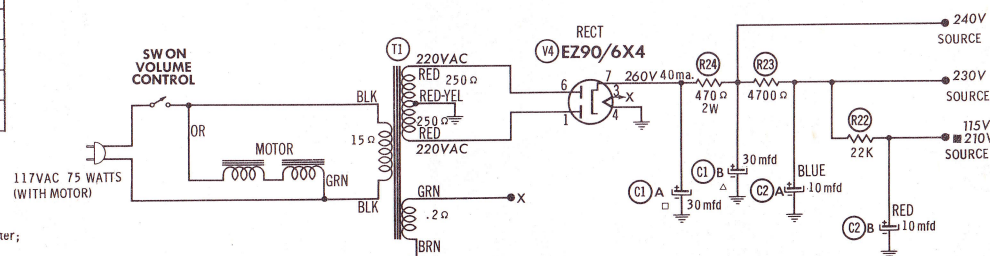
ALL VOLTAGE MEASUREMENTS TAKEN IN "PLAY" POSITION UNLESS OTHERWISE DESIGNATED.
 † THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
 TAKEN IN "RECORD" POSITION.
 ‡ MEASURED FROM PIN 7 OF V4.
 NC NO CONNECTION
 TP TIE POINT

SEE PARTS LIST FOR ALTERNATE
 VALUE OR APPLICATION

NUMBERS ASSIGNED TO COILS, SWITCHES, PLUGS, SOCKETS, AND TRANSFORMERS ARE TO FACILITATE CIRCUIT TRACING OR COMPONENT REPLACEMENT AND MAY NOT NECESSARILY BE FOUND ON THE UNIT.

A PHOTOFAC STANDARD NOTATION SCHEMATIC
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1. DC voltage measurements taken with vacuum tube voltmeter;
2. AC voltages measured with 1000 ohm per volt voltmeter.
3. Socket connections are shown as bottom views.
4. Measured values are from socket pin to common ground.
5. Line voltage maintained at 117 volts for voltage readings.
6. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
7. All controls at minimum, proper output load connected.



RECORDIO
 MODEL 220

AMP PARTS LIST AND DESCRIPTIONS

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in 12 Colors
Power Cord	8524 (Stranded) Available in 12 Colors
Power Cord (Interlock Type)	Use BELDEN No. 17106 (Plastic) or 17126 (Rubber) - 6 Ft.
Low-Loss Shielded Lead (Interconnecting)	17109 (Plastic) or 17129 (Rubber) - 9 Ft.
Phono Pick-up Arm Cable	Use BELDEN No. 8874 (Rubber) or 8895 (Plastic)
	8401 or 8421
	Use BELDEN No. 8430 (Two Conductor-Unshielded)
	8429 (Two Conductor-Shielded)
	8419 (Three Conductor-Shielded)

TUBES

AMPEREX			GENERAL ELECTRIC			RAYTHEON			SYLVANIA		
ITEM No.	USE		TYPE			ITEM No.	USE		TYPE		
V1	Preamplifier		12AX7/ECC83			V3	Output		EL90/6AQ5		
V2	AF Amplifier		EBC91/6AV6			V4	Rectifier		EZ90/6X4		

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	RECORDIO PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	GENERAL ELECTRIC PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.
C1A	30	250	B5.437	PRS2300	BBRD1145	B0220	FP321.5	TMT3432	TVLS-3513.2*
B	30	250				BBR25-25			
C	30	25	B5.444	PRS2300	BBRD1145	QT2-3	TCS52	TDLD-26	TVA-2722
C2A	10	200							
B	10	200							

* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

ITEM No.	RATING	REMARKS	REPLACEMENT DATA						
			AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ELMENCO PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	820 10%	#B-4.144	1469-00082	DD-503	5R5T82	CM-19B-821K	MCB251	MS-382	
C4	470 10%		1469-00047		5R5T47	CM-19B-471K	MCJ244	MS-347	
C5	.047 200V		P288N-047		CUB2S47	4DP-3-473	GEM-4147	2TM-S47	
C6	.01		BPD-01		BYA10S1	CCD-103	B-110	5HK-S10	
C7	.001		SI 1000		BYA10D1	CCD-102	B-210	5HK-D10	
C8	.01		BPD-01		DD-103	CCD-103	B-110	5HK-S10	
C9	.01		BPD-01		DD-103	CCD-103	B-110	5HK-S10	
C10	470		D1-470		DD-471	BYA10T47	CCD-471	B-347	10TS-T47
C11	100		D1-100		DD-101	L10T1	CCD-101	GP310	10TS-T10
C12	.003		DI-3000		DD-302	BYA10D3	CCD-302	GP230	10TS-D30
C13	100	D1-100	DD-101	L10T1	CCD-101	GP310	10TS-T10		
C14	.01	BPD-01	DD-103	BYA10S1	CCD-103	B-110	5HK-S10		
C15	.0047 600V	P688N-0047	D6-472	CUB6D47	6DP-1-472	GEM-6247	6TM-D47		
C16	220	DI-220	DD-221	L10T22	CCD-221	GP322	10TS-T22		
C17	3-35	#B-4.146 Note 1	BPD-01 P688N-047 1469-00022	DD-103 DD-503 TCZ-220	BYA10S1	CCD-103	B-110	5HK-S10	
C18	.01				CUB6S47	6DP-3-473	GEM-6147	5HK-S10	
C19	.047 600V				22R5T22	CM-19B-221K	CNO-322	6TM-S47	
C20	220 10%				462	CCD-152	B-215	MS-322	
C21	5-70				BYA10D15				
C22	.0015	SI 1500	D6-152						

Recordio Part Number.
Note 1. Not used in some versions.

CONTROLS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	USE	RESISTANCE	REPLACEMENT DATA				
			RECORDIO PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	CTS-IRC PART No.	MALLORY PART No.
R1	Volume & Power Sw.	1meg 500K Tap	C-8.227-2①	BT-74, KR-1, (ABT-74, KR-1, AK-7)	A47F5-1meg/ FS-3, SWE	Q19-137X, 76-1, (BUL, CF47T, SSI, GC) †	UT443, US-26, (UA16T454, US-41, SL-3500)
R2	Tone & Monitor Sw.	250K	C-8.249-1②	B-51, KR-1, (AB-51, KR-1, AK-7)	A47-250K-Z, SWE-12, FS-3	Q13-130, 76-1, (BUL, CF23, SSI, GC) †	U44, US-26, (UA254A, US-41, SL-3500)

① Alternate Part #C-8.227-17.

② Alternate Part #C-8.249-2.

† "SNAPTROL".

RECORDIO
MODEL 220

FOLDER 5

AMP PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING	REPLACEMENT DATA			ITEM No.	RATING	REPLACEMENT DATA		
		IRC PART No.	WORKMAN PART No.	REMARKS			IRC PART No.	WORKMAN PART No.	REMARKS
R3	330K				R15	1.5meg			
R4	1.5meg				R16	120K			
R5	8200Ω 1W				R17	330Ω 1W			
R6	680K				R18	270K 1W			
R7	4.7meg				R19	270K			(330K) *
R8	150K				R20	3.3Ω			
R9	470K				R21	22K 1W			
R10	100K				R22	22K			
R11	6.8meg				R23	4700Ω			
R12	180K				R24	470Ω 2W			
R13	47K				R25	68K			Note 1
R14	470K								

* Alternate.

Note 1. Not used in some versions.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		RECORDIO PART No.	Merit PART No.	Miller PART No.	Stancor PART No.	Workman PART No.	
L1	Bias Osc.						

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA					NOTES
	PRI.	SEC. 1	SEC. 2	RECORDIO PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	117VAC .26A	440VCT @ .040A	6.7VAC @ 1.6A	C-9, 281					

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI.	SEC.	RECORDIO PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	5500Ω	3-4Ω	C-9, 264	A-2935	A-3877	24S51	S-5X	

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	RECORDIO PART No.	QUAM PART No.	
SP1	4"x 6"	PM	6-8Ω	C-30, 354-2	46A07Z6, 4	
SP2	4"x 6"	PM	6-8Ω	C-30, 354-2	46A07Z6, 4	

MISCELLANEOUS

ITEM No.	PART NAME	RECORDIO PART No.	NOTES
M1	Head	B-36, 251	Record - Playback
M2	Switch	B-11, 247	Record-Playback (Rotary Wafer Type)